and even its eager embrace of the faddist, the charlatan and the quack, not only says that it does not want the well educated and highly trained man, but makes it impossible often for a man to become well educated and highly trained. This introduction should be read by every father and mother in the country, and especially by the particular fathers whom the fathers and mothers of any state may send to that state's legislature, to set forth the laws which shall regulate the qualifications of the physicians who shall treat their sons and their daughters. H. M. S.

THE EDUCATIONAL VALUE OF MOVING PICTURES.

Since 1910 it has not been an uncommon event at European scientific congresses to witness a display of moving pictures illustrative of physiological phenomena and the life of microscopic human parasites. In this country, with the exception of a few demonstrations made in the East, little attention has been paid to the subject by universities and medical societies.

Some years ago a Parisian surgeon earned the distinction of being the first, the writer believes, to employ moving pictures in medicine or surgery. This record of an operation on a world-famous subject was later shown to the public, against his will said the surgeon, who won a suit for damages against the film manufacturers after he had been severely criticized by his confreres. (It has never been proven that this remarkable surgeon was a silent partner of the manufacturers.) This same man showed various films at Edinburgh whose University conferred the LL. D. upon him in recognition of the value of his services.

T. W. Weisenburg of Philadelphia (J. A. M. A., Dec. 28, 1912) in an article entitled "Moving Picture Illustrations in Medicine," draws the attention of the profession to this advance of contemporary science as applied to medicine. All of his work has been with the nervous or insane, the various gaits, tics and convulsions lending themselves particularly well to motion photography. The importance of such cinematographic records for teaching purposes cannot be overestimated, and while Weisenberg naturally does not claim that film demonstrations are preferable to demonstrations of patients, he has found that the former will frequently interest students more than the latter. Of great value is the possibility of fine analyses of movements, e. g. of a rapidly occurring convulsion when the original is reproduced greatly enlarged and when the speed of the film can be regulated at will.

Quite recently, thanks to Dr. W. Tait, physicians and university students in the Bay Counties enjoyed the opportunity of witnessing the great educational possibilities in this field. The films were from the firm of Graumont and were made in various Parisian laboratories. Subjects demontrated were, 1, the contractions of the frog's heart; 2, circulation in arteries, veins and capillaries of a rabbit; 3, study of the blood and blood dust under the ultra microscope; 4, a series of experiments on peristalsis by the method of perfusion; 5, various forms of intestinal parasites; 6, study of spirochaetes; 7, demonstration of agglutination of spirilla in the blood of the chicken; 8, study of dental tartar under the dark field illumination; 9, study of water under the ultra microscope.

There is no doubt that in the future motion pictures are destined to play an important role in the education of the medical student just as they are to-day playing a tremendous role in the education of the public. The so-called "Nickelodeon," which as a result of the increase in the cost of living may soon be re-christened "Dimodeon," has certainly done a great deal in the teaching of history, of geography, or art, many of the lessons being easily swallowed and well assimilated in this gelatin-film coated form, whereas these same lessons might not have been at all digested if presented even on a series of so-called lantern slides.

The repetition by medical students of physiological experiments, necessitating the sacrifice of thousands of animals yearly, bitterly antagonizing the so-called antivivisectionists, will surely be rendered far less common so soon as the use of motion pictures becomes generalized.

The Edison Company has recently sent out a prospectus announcing the production of a small inexpensive moving picture machine, with small sized films, and recommended its adoption by universities and medical societies. The very serious objection to the adoption of this small machine is that it cannot be used for the demonstration of *standard sized films,* such as are being made by numerous manufacturers in this country and abroad. Any departure from a standard gauge would seem to be just as much a mistake with a moving picture apparatus as with a modern microscope. Several workers in this State are at present perfecting a portable machine, overcoming this objectionable feature, and with the marketing of a perfected machine in the near future we may expect to see a marked development in the use of moving pictures in medicine. R. B.

ORIGINAL ARTICLES

SUCCESSFUL REMOVAL OF AN INTRADURAL TUMOR FROM THE SPINAL CANAL.*

By L. NEWMARK, M. D., and HARRY M. SHERMAN, M. D., San Francisco.

Medical part by L. Newmark, M. D.

When Mrs. R., aged 45 years, was first seen by me July 12, 1911, her right lower extremity was so weak that she walked with great difficulty, even when supported. Power in the left lower extremity was not appreciably reduced. On both sides an extensor Babinski reflex, patellar and ankle clonus could be elicited, and in both lower limbs and on the trunk sensibility was diminished. Urination, she said, was a trifle slow. She denied having pain in the back or anywhere else.

It was learned that the condition thus summarily described had developed *gradually.* In July, 1910, the patient first felt a burning in the left lower

* Read before the San Francisco County Medical Society, January, 1913.

extremity and she still felt "as if there were a large scratch there." From Dr. Clark Burnham and Dr. H. C. Moffitt, who had first examined her in September, 1910, the information was obtained that she had been weak in the legs for about ten months and that she had presented the Brown-Séquard combination of symptoms—motor disturbance in the right leg and sensory in the left.

Obviously there was a progressive obstacle to conduction in the spinal cord. As will be seen, there was tenderness to pressure in some of the spinous processes, but no indication of a tuberculous or other disease in the spinal column itself. Compression of the cord by a tumor seemed more probable. The absence of pain, however, although by no means an insuperable objection to this diagnosis, was nevertheless enough to make us pause a little, and in the laboratory my predecessors in the case had encountered another stumbling-block in the shape of a positive Wassermann reaction in the blood serum.

As I have set forth elsewhere,[1] a recent experience had made me disinclined to acquiesce implicitly in the decision of that test even after it had been corroborated by another positive reaction in the spinal fluid which I withdrew a few days later. At all events, whether syphilitic or not, the disease had resisted much and various specific treatment, and consequently a surgical operation was clearly indicated, so that the problem became one of localization of the lesion. Still, out of deference to the Wassermann test, specific treatment was continued during the time required for repeated examinations of the patient and for observing the development of the symptoms.

In the absence of root symptoms, the level of the lesion had to be inferred from the uppermost determinable extension of the anesthesia, due allowance being made for the common discrepancies between the level indicated by the anesthesia and the actual site of the lesion.

At the first examination on July 12 it was the perception of cold and heat that was most disturbed in the lower extremities, while sensibility to touch and pin pricks seemed but slightly affected, if at all; but two days later there was a decided hypalgesia throughout both lower extremities, while the recognition of tactile and thermic stimuli was but little impaired. From the first examination on I was struck by the impairment of sensibility on the anterior surface of the right thigh being deeper than on the right leg or anywhere else. This local excess of anesthesia aroused misgivings as to the focal nature of the disease and made us occasionally consider the possibility of some complication; but these doubts were not justified by the event.

Stroking the sole of the *left* foot caused a keener sensation than that of the right and the resulting reflex contraction was livelier on the left than on the right. The abdominal reflexes were absent now and subsequently.

When delicate touches with cotton wool were applied to the skin of the trunk, proceeding from above downward, on both days they were announced to be less keenly felt at the level of the eighth spinous process, and the line of transition to comparative tactile dullness went straight around the body. And the eighth spinous process appeared distinctly tender to pressure, as did in a lesser degree the neighboring spines. But we were far from utilizing these first findings for the purpose of localization.

On July 18 lumbar puncture was performed. The pressure of the fluid was low. About 6 cc. was withdrawn. The sequel, no doubt an effect, of the puncture, was startling; for at the next visit it was found that the paresis of the right lower extremity had become an almost total paralysis, the only power persisting in it being that of slight extension of the leg when the thigh was passively flexed; and it was learned that the change had occurred on the day of the puncture. The eighth spinous process had become much more tender and the patient now complained so much of pain in the region of this dorsal process going through the body that she required morphine once a day. The sixth and seventh processes had also become tender, but the eighth was the worst.

On July 30 the sixth process was found to be the most tender to manipulation; two weeks later the fifth surpassed it in this respect and the fourth was also somewhat sensitive. When the patient inclined her head she said that she felt pain in the back at a point determined to be the fifth dorsal process, and from here the pain went through into the chest and followed the ribs around the thorax.

Soon after the lumbar puncture the right thigh drew up towards the abdomen and the patient was utterly unable to extend it; this flexion at the hip persisted for three weeks and then disappeared, leaving the whole limb flaccid and totally paralyzed, with the exaggerated reflexes as observed in the beginning. By the latter part of August the left lower extremity showed a very slight tendency to loss of power, weakness appearing in abduction of the left foot. Urination had become a little more difficult.

At this time there was more or less diminution of sensibility to tactile, cold, warm, and painful stimuli on both sides of the trunk and in both lower extremities. The highest level at which we could determine a change of sensibility of any kind was, in front, that of the junction of the manubrium of the sternum and the ensiform process, where a dullness in the perception of cold existed, and in the back that of the fifth dorsal spinous process to which a reduced sensibility to thermic and painful stimuli could be traced. On some days tactile perception also was found lessened as far upward as the fifth spinous process, on other days its lessening began at a lower level.

The hypesthesia in front corresponded to the sixth dorsal segment, that in the back to about the fourth, according to Seiffer's diagrams.

The fourth segment is opposite the base of the third dorsal process, but the common experience that tumors are sought too low gave reason for believing that the compression in this case might be even higher. On the other hand, from the behavior of the cerebrospinal fluid at the lumbar puncture it was inferred that there was a

damming up of the fluid above the point of compression and it was thought possible that the accumulated fluid above a tumor might cause a pressure upon the cord at a higher level than that of the tumor itself. It was to a tighter jamming of the tumor in consequence of the withdrawal of the fluid below it that we attributed the loss of the remaining power in the right lower extremity after the lumbar puncture. So, by limiting the opening of the spinal canal too strictly in accordance with reasoning upon the anesthesia there seemed to be some slight danger of looking too high for the tumor.[2] Furthermore the great tenderness of the fifth spinous process seemed to appeal for some consideration, although we bore in mind that other spinous processes had at various times held our attention. There was little likelihood of overlooking a tumor if the opening was extended from the fifth to the second process. Accordingly the operator was requested to begin his incision over the fifth spinous process, although the conviction was quite firm that the tumor would be found at a considerably higher level. It was found under the second dorsal arch, on the right side of the cord.[3]

The operation was performed on the 31st of August, 1911. On the next morning the patient announced that she had recovered some power of motion in the right ankle and on September 2 we convinced ourselves that she could move the right foot quite freely. A few days later it was found that the power to abduct the left foot had been restored. By September 9, the Babinski sign in the left foot had become modified inasmuch as it could now be provoked only from the heel, whereas irritation of other parts of the sole produced a flexor response; two weeks after the operation, by very careful manipulation a slight tendency to the extensor response could still be detected there, but in the right foot the Babinski sign remained fully developed and it persisted for a considerable time longer. Sensibility had improved very much in the left extremity within two weeks after the operation, and also in the right leg, but in a less degree; but on the anterior surface of the right thigh there was still a pronounced anesthesia on September 15. On October 20, however, a careful survey by Dr. Beerman disclosed normal sensibility everywhere.

In December, 1911, the patient had preserved a slight limp from the tendency of the right foot to turn inward, but there is now a complete restoration of all functions.

A few points deserve a little additional attention:

1. The effect of the lumbar puncture. The only mention of a similar occurrence known to me is in the report of a case of tumor compressing the cord by Raven,[4] where it is related that "the next evening" after a lumbar puncture a sudden aggravation of the paralysis and anesthesia took place. One is reminded of the evil consequences of lumbar puncture in some cases of tumor of the brain and of the fatalities especially to be apprehended from it when the growth is situated in the cerebellum. A general warning against so useful a procedure in cases of tumor affecting the cord would hardly be justified by this very limited unfavorable experience.

2. The upward movement of the spinal tenderness and the anesthesia. When the level of the compression is to be ascertained, in the absence of root symptoms, from the uppermost extent of the anesthesia it is well to bear such a tendency in mind, particularly in an early period of the disease, when the compression is slight; otherwise the tumor will be sought too low. In a case of Köster's[5] there was at first tenderness of the eighth, ninth, and tenth dorsal processes, a month later of the fifth, and in a couple of months more it was most pronounced in the fourth; there was also a gradual ascent of the anesthesia; the tumor was found under the third dorsal process. Well-marked tenderness is suggestive and luring, when it is first observed, but in the course of the disease it is likely to shift and seems to be very misleading.

3. The result of the Wassermann reaction. Despite the overwhelming evidence in support of the value of this method for the detection of syphilis it does not seem superfluous to again advert to the errors into which we may occasionally be led by it. The publication of my experience in this case and in another one in the *Journal of the American Medical Association* immediately brought me a letter from Chicago, in which the writer related that in one case a positive Wassermann reaction had caused a disease of the tongue to be treated specifically until carcinomatous metastases appeared and deprived the patient of whatever chance a surgical operation might have offered, and that in another a cranial operation was allowed to proceed despite a positive reaction and revealed a glioma. Last year, induced by repeated reports of a positive reaction I persisted unduly with anti-syphilitic treatment of a boy who presented the symptoms of disease in the foot center of the brain, until finding my efforts unavailing I sent him to Dr. Harvey Cushing for operation and learned that the disease was an endothelioma. Some there are who consider the test sufficient warrant for assuming that in all these cases a latent syphilis was revealed co-existing with the other disease; others towering in the confidence of superior technic may impugn the competence of my collaborators. But it appears from recent German literature[6] that there is experimental evidence as well as clinical testimony to show that when organs which contain an abundance of lipoids are destroyed by a non-syphilitic disease the Wassermann reaction may be positive. At all events, it does not seem to me to be presumptuous to advise that, when a tumor of the central nervous system is probable, confidence in the Wassermann method be tempered by remembrance of human fallibility in matters even less complicated.

Surgical part by H. M. Sherman.

My preoperative duties in the case of Mrs. R. consisted in carefully going over the details of

the history and his physical findings with Dr. Newmark. Concurrence with his opinion was inevitable and I took charge of the patient for the operation which was done on the 31st of August.

I followed, as nearly as I might, the technic of Cushing. This includes an incision directly upon the tips of the spinous processes. Each tip is then bitten off with a rongeur—the periosteum is next stripped from the side of each process, and incisions are made, from process to process, exactly in the mesial plane separating the muscular layers of the two sides. The processes are then cut off close to the laminae. The hemorrhage has been insignificant, and the necessity of hot sponge packing to check the bleeding from the spinal veins is wholy avoided. The spinal canal is then opened by a large Doyen burr which cuts out the cancellous tissue of the spinal arch at the point where the laminae and the spinous process meet, and then cuts the cortex of the laminae on their deeper side just as the tabula vitrea is cut in opening the skull. The rest of the laminae are then cleared of the periosteum on their superficial aspect and the bone is rongeured away from the periosteum on the deeper surface. An incision through the soft tissues which are left, made exactly in the midline, exposes the peridural fat and the dura mater.

I began, in the way, mentioned on the fifth dorsal vertebra, then I took the sixth and then the fourth. The exposed thecas could be felt as rather lax, surely not tense, and as there was nothing abnormal to be seen or felt, it was decided to take off the third lamina before opening the dura. There was no pulsation noticed through the dura and when it was opened the cerebro-spinal fluid was seen to be very scanty and the cord was not pulsating. A probe passed up and down the canal outside the dura encountered no obstacle. At Dr. Newmark's request I removed the lamina of the second vertebra and in extending the incision in the dura up across this space I encountered a little bony plaque 7 to 8 mm. long and 3 to 4 mm. wide. It was quite firmly adherent to the dura and I dissected it loose, thinking it represented a tumor. Under it I found a tumor mass, adherent to the dura and pressing on the cord. It was soft and tore easily, but I succeeded in pulling it out between the third and fourth nerve roots from its location in front of the cord. As it came out a gush of cerebrospinal fluid followed, evidencing the existence of exactly the conditions Dr. Newmark had supposed from the symptoms complex. To entirely separate the tumor I had to clip out a portion of the dura mater to which it was adherent and in closing the dura I was obliged to leave this gap open as I did another gap, a little cephalad, where was clipped out another bony plaque.

The wound was closed by tiers of sutures approximating the parts anatomically and there was normal healing.

Recovery was uneventful except for pain. This was severe, at first steady and exhausting, then spasmodic, especially started by any movement; later it was erratic and irregular—once described as a twitching feeling all through the back and chest. Pain was the only complaint with which I had to deal. Dr. Newmark has recorded the restoration of function in the cord as shown by the recovery from the paralysis and the return of sensation. On the 29th of September, twenty-nine days after the operation, I had her stand up and walk, and from that time her recovery was rapid to completion.

In the case of a woman with a spinal cord tumor upon whom I operated, which was reported to this society by Dr. Herbert C. Moffitt the patient walked first upon the thirty-first day. Both of these women are now perfectly well in cord functions as in others.

Of the tumor Professor Ophuls reported that "Sections show tissue made up of large spindle cells, in which there are many calcified concentric granules," and he added the diagnosis "Psammoma of the dura mater."

In both of these cases the tumors have had relations to the dura mater, the former was stuck to the dura, but could be easily scraped off—the latter was more closely united and the dura had to be cut away to free the tumor. Pathologically this obeys the rule of intradural extra-medullary tumors.

In looking up some other case reports I found that George P. Muller of Philadelphia, a year ago, had quoted Starr's 1895 list of 123 cases, in twenty-two of which operation was done with a mortality of 50% and but six recoveries. Muller adds cases reported by Collins, Oppenheim, Bailey and Hunt and Woolsey, Moffitt and Sherman and himself; in all 116 cases, in which 76 operations were done with the recovery of 35 from the effects of the tumor. This is in keeping with Oppenheim's statement, also quoted by Muller, that recovery may be attained in about 50% of cases "Presenting a typical clinical picture of extra medullary growth."

Muller comments on the risk of the operation per se and quotes Krause's eight deaths in twenty-six operations.

Recently Coley has discussed the operative risks of laminectomy. It has come to me to do the operation a good many times and in all parts of the canal. I have taken off the sixth, fifth and fourth and third cervical laminae, and we could then look up into the skull and see the lower surface of the cerebellum. I have operated many times for pressure paraplegia in the dorsal region as well as for cord crushes in both cervical and dorsal and I have exposed the whole of the lumbar enlargement. One of my patients who was moribund, died on the operating table. All of the others have made good operative recoveries, though few have had the good fortune which has come to these two women with the intradural tumors. As my operative ability and technic is in no way extraordinary, I think I must class the operation as one in which the cutting can be

limited to connective tissues and in which therefore the operative risk itself is slight.

1 "The Occurrence of a Positive Wassermann Reaction in Two Cases of Non-Specific Tumor of the Central Nervous System." Journal of the American Medical Association, January 6, 1912.

2 See a statement by Nonne in the Neurologisches Centralblatt, 1908, p. 751.

3 According to the diagram of Dejerine and Thomas, the second arch corresponds to the fourth dorsal segment; according to Gowers' diagram, it corresponds to the third.

4 Raven. Deutsche Zeitschrift für Nervenheilkunde, Vol. 44, p. 386.

5 Neurologisches Centralblatt, 1907, p. 520.

6 Bittorf and Schidorsky, Experimentelle Untersuchungen über das Wesen der Wassermann'schen Reaktion, Berliner Klinische Wochenschrift, 1912, No. 42.

THE VARIATIONS OF THE CLINICAL PICTURE OF MENINGEAL AFFECTION IN PULMONARY TUBERCULOSIS IN ADULTS. WITH CASE REPORTS.

By J. L. POMEROY, M. D., Monrovia.

Whenever a case of pulmonary tuberculosis begins to show symptoms of meningeal irritation, the diagnosis of tubercular complication is generally predicted. No doubt this is as a rule correct; occasionally, however, one finds little at autopsy to verify such a diagnosis. The following case illustrates these statements and on that account should possess some interest.

The patient, G. V., male, age 30 years, had been suffering from pulmonary tuberculosis for three years, and at the time when first seen was in an "arrested" condition, doing a small amount of work, daily. One sister had died from tubercular meningitis, as a complication of pulmonary disease. No other facts of importance in the family history. The symptoms from which he demanded medical care came on suddenly. The patient was working in his garden when he began to suffer from intense frontal headache. This continued for several days when he began to vomit. At this time he presented the following: Patient was a large, well-formed, muscular man, slightly under weight, face flushed, pupils small, equal in size and sluggish in reaction to light and accommodation. There was no tenderness over the head, no rigidity of neck muscles, no history of syphilis, middle ear or sinus disease. Hearing and other senses normal. Mind perfectly clear. The knee jerks were absent and only a faint ankle jerk could be obtained. No changes in sensation. The pulse was slow (60 per minute), full and regular. Temperature 101° (10 a. m.). There was diffuse infiltration throughout entire right upper lobe with small cavity at apex. The lower lobe and middle lobe showed only slight thickening. There were few rales throughout these areas. The left upper showed signs of old fibroid condition with diminished resonance, and harsh breathing throughout with scattered fine rales. The right border of the heart was found about 1½ inches to the right of the sternum, apex normal, no murmurs. There was a slight amount of muco-purulent expectoration in which there were abundant tubercle bacilli. The abdomen was slightly retracted, no tenderness, stomach borders normal, no tumor or other pathological findings.

The headache was continuous, boring in character and located mostly in the frontal regions. The bowels were very costive. The patient retained but little food upon the stomach. The vomiting was almost "projectile" but not altogether so.

The patient was placed in a hospital under close observation, the 3rd day of his illness. The temperature varied from 97.2° f. in a. m. to about 101° f. p. m., pulse remained from 60 to 70 per minute. The bowels persistently refused to move even after large doses of salts, calomel, etc. Recourse was had to high colon flushings three times daily. Finally after three minims of croton oil in divided doses evacuation was secured. Morphine and chloral in large doses were the only drugs which seemed to relieve the headache.

The patient gradually became more and more restless and needed careful watching. Nevertheless his mind remained clear until shortly before death. Lumbar puncture was performed on the fourth dav of observation with the following results: The fluid flowed under considerable pressure, 15cc. was withdrawn; it was clear and limpid; albumen slightly increased, no polynuclear cells, but a slight increase in lymphocytes 16-20 per cu. mm., injection of fluid in peritoneal cavity of guinea pig gave positive results for tubercle bacilli. Ophthalmoscopic examination of eyes showed marked "choked disc" in both eyes.

After the lumbar puncture the patient's symptoms slightly improved; for two days he was able to take nourishment, and the headaches became less severe. Soon, however, they returned with greater intensity. Repetition of the puncture was refused. The neck muscles showed slight rigidity, the patient became unable to name objects presented to him, although he apparently understood what they were (paraphasia), was conscious of his surroundings. The knee jerks remained absent, the ankle jerk was slightly increased, and there was an uncertain Babinski. There was never any paralysis. Kernigs' sign became positive only a few days before death. His speech gradually became jumbled, although it was quite apparent that he knew what he wanted to say. The sphincter control was never lost or disturbed.

Urinalysis was entirely normal. The blood count showed only a moderate leukocytosis, the differential count was as follows: lymphocytes 25%, large mononuclears 5%, eosinophiles .5%, polynuclears 72.5. Total W. B. C. 10,000. No changes of note in the red cells. Hemoglobin Sahli 65%.

The patient gradually sank into coma, the lungs filled, became edematous, and death occurred nine davs after onset of the symptoms. A brief abstract of the post mortem findings follows.

On removing the skull cap the dura was densely adherent, the veins much dilated and markedly congested. The brain seemed to be markedly tense. There were slight fine adhesions over the entire cortex, and the pia showed marked edema and in places over the cerebrum fine thickenings and opacities. Nowhere were tubercles to be found. On sectioning of the brain the right ventricle was much dilated with fluid, but no other gross pathological changes were noted. The convolutions were everywhere well formed, and well developed. Microscopical examination of sections taken from the membranes and various regions of the brain, showed only slight pial infiltration and perivascular infiltration and thickening. There were present definite acute inflammatory changes but no areas of necrosis were to be demonstrated.

There were dense adhesive changes between the parietal and visceral pleura over both apices. The right lung showed multiple foci of tubercular infiltration throughout the entire upper lobe. The lesions on the whole were fairly well encapsulated. Scattered foci also appeared through the middle and lower lobes. The left upper lobe was also infiltrated throughout with scattered areas of fairly normal lung tissue. The lower left lobe was relatively clear. The bronchial glands were partly caseous and softened. Nothing of note was observed in the heart, liver and remaining organs.

Autopsy summary. Chronic pulmonary tuber-